

Application No.: 09/786,325

Docket No.: 21581-00255-US

AMENDMENTS TO THE CLAIMS

Please cancel claims 1-18 without prejudice to their reentry at some later date.

1-18 (Cancelled)

19. (Withdrawn) A method of producing a vinyl polymer (II) having a hydrolyzable silyl group at one or more termini thereof

which comprises reacting a vinyl polymer (I) having a silanol group at one or more termini thereof

with a silicon compound having two or more silicon atom-bound hydrolysable groups.

20. (Withdrawn) The method of producing according to Claim 19,

wherein the vinyl polymer (I) has a main chain obtained by polymerizing at least one monomer selected from the group consisting of (meth)acrylic monomers, acrylonitrile monomers, aromatic vinyl monomers, fluorine-containing vinyl monomers and silicon-containing vinyl monomers.

21. (Withdrawn) The method of producing according to Claim 19,

wherein the silanol group of the vinyl polymer (I) is represented by the general formula (1):



wherein R¹ and R² are the same or different and each represents an alkyl group containing 1 to 20 carbon atoms, an aryl group containing 6 to 20 carbon atoms or an aralkyl group containing 7 to 20 carbon atoms or a triorganosiloxy group represented by (R')₃SiO-, in which R' is a monovalent hydrocarbon group containing 1 to 20 carbon atoms and the three R' groups may be the same or different; when there are two or more R¹ or R² groups, they may be the same or different; a represents 0, 1, 2 or 3, b represents 0, 1 or 2, and m is an integer of 0 to 19, provided that the relation a + mb ≥ 1 should be satisfied.

22. (Withdrawn) The method of producing according to Claim 21, wherein, the general formula (1), m = 0.

23. (Withdrawn) The method of producing according to Claim 19,

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wherein the vinyl polymer (I) has a ratio (Mw/Mn) of weight average molecular weight (Mw) to a number average molecular weight (Mn) of less than 1.8 as determined by gel permeation chromatography.

24. (Withdrawn) The method of producing according to Claim 19, wherein the vinyl polymer (I) has a main chain obtained by living radical polymerization.

25. (Withdrawn) The method of producing according to Claim 24, wherein the living radical polymerization is carried out in the manner of atom transfer radical polymerization.

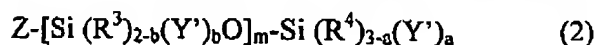
26. (Withdrawn) The method of producing according to Claim 25, wherein a metal complex to be used as a catalyst for the atom transfer radical polymerization is a copper, nickel, ruthenium or iron complex.

27. (Withdrawn) The method of producing according to Claim 26, wherein the catalyst for atom transfer radical polymerization is a copper complex.

28. (Withdrawn) The method of producing according to Claim 19, wherein the vinyl polymer (I) is obtainable by carrying out the hydrosilylation reaction of a vinyl polymer having an alkenyl group at one or more one termini thereof with a silicon compound having both a silicon atom-bound hydrolyzable group and a hydrosilyl group and then converting said hydrolyzable group to a silanol group by hydrolysis.

29. (Withdrawn) The method of producing according to Claim 28, wherein the silicon compound having both a silicon atom-bound hydrolysable group and a hydrosilyl group is chlorodimethylsilane.

30. (Withdrawn) The method of producing according to Claim 19, wherein the silicon compound having two or more silicon atom-bound hydrolyzable groups is represented by the general formula (2):



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wherein R^3 and R^4 are the same or different and each represents an alkyl group containing 1 to 20 carbon atoms, an aryl group containing 6 to 20 carbon atoms, an aralkyl group containing 7 to 20 carbon atoms or a triorganosiloxy group represented by $(R')_3SiO-$, in which R' is a monovalent hydrocarbon group containing 1 to 20 carbon atoms and the three R' groups may be the same or different and, when there are two or more R^3 or R^4 groups, they may be the same or different, Y' represents a hydrolyzable group other than a hydroxyl group, Z represents an alkyl group containing 1 to 20 carbon atoms, an aryl group containing 6 to 20 carbon atoms, an aralkyl group containing 7 to 20 carbon atoms, a triorganosiloxy group represented by $(R')_3SiO-$, in which R' is as defined above, or a hydrolyzable group other than a hydroxyl group, a represents 0, 1, 2 or 3, b represents 0, 1 or 2 and m is an integer of 0 to 19 provided that when Z is a hydrolyzable group, the relation $a + mb \geq 1$ should be satisfied and, when Z is other than a hydrolyzable group, the relation $a + mb \geq 2$ should be satisfied.

31. (Withdrawn) The method of producing according to Claim 30,

wherein the hydrolyzable groups, namely Y' and Z , in general formula (2) are each selected from the group consisting of ketoximo, acyloxy, alkoxy, amido, aminoxy, amino and alkenoxy groups.

32. (Withdrawn) The method of producing according to Claim 30, wherein, in general formula (2), $m = 0$.

33. (Withdrawn) A vinyl polymer having a hydrolyzable silyl group at one or more termini thereof and obtainable by the method of producing according to Claim 19.

34. (Withdrawn) A curable composition

which comprises the vinyl polymer having a hydrolyzable silyl group at one or more termini thereof according to Claim 33.

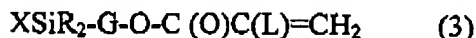
35. (Withdrawn) A method of producing a vinyl polymer (III) having an acrylic functional group at one or more termini thereof

which comprises reacting a vinyl polymer (I) having a silanol group at one or more termini thereof

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with a silicon compound represented by the general formula (3):



wherein R is a hydrocarbon group containing 1 to 14 carbon atoms or halogenated hydrocarbon group containing 1 to 10 carbon atoms and the two R groups may be the same or different, X is a hydrolyzable group, G is an alkylene group containing 1 to 4 carbon atoms and L is a hydrogen atom or a hydrocarbon group containing 1 to 20 carbon atoms.

36. (Withdrawn) The method of producing according to Claim 35,

wherein, in general formula (3), G is a group represented by $-\text{CH}_2-$, $-\text{CH}_2\text{CH}_2-$ or $-\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2-$

and L is a hydrogen atom or methyl group.

37. (Withdrawn) The method of producing according to Claim 35;

wherein, the vinyl polymer (I) has a main chain obtained by polymerizing at least one monomer selected from the group consisting of (meth) acrylic monomers, acrylonitrile monomers, aromatic vinyl monomers, fluorine-containing vinyl monomers and silicon-containing vinyl monomers.

38. (Withdrawn) The method of producing according to Claim 35,

wherein the silanol group of the vinyl polymer (I) is represented by the general formula (1):



wherein R^1 and R^2 are the same or different and each represents an alkyl group containing 1 to 20 carbon atoms, an aryl group containing 6 to 20 carbon atoms or an aralkyl group containing 7 to 20 carbon atoms or a triorganosiloxy group represented by $(\text{R}')_3\text{SiO-}$, in which R' is a monovalent hydrocarbon group containing 1 to 20 carbon atoms and the three R' groups may be the same or different; when there are two or more R^1 or R^2 groups, they may be the same or different; a represents 0, 1, 2 or 3, b represents 0, 1 or 2, and m is an integer of 0 to 19, provided that the relation $a + mb \geq 1$ should be satisfied.

39. (Withdrawn) The method of producing according to claim 38,

wherein, in general formula (1), $m = 0$

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40. (Withdrawn) The method of producing according to Claim 35, wherein the vinyl polymer (I) has a main chain obtained by living radical polymerization.

41. (Withdrawn) The method of producing according to Claim 40, wherein the living radical polymerization is carried out in the manner of atom transfer radical polymerization.

42. (Withdrawn) The method of producing according to Claim 41, wherein a metal complex to be used as a catalyst for the atom transfer radical polymerization is a copper, nickel, ruthenium or iron complex.

43. (Withdrawn) The method of producing according to Claim 42, wherein the catalyst for atom transfer radical polymerization is a copper complex.

44. (Withdrawn) The method of producing according to Claim 35, wherein the vinyl polymer (I) is obtainable by carrying out the hydrosilylation reaction of a vinyl polymer having an alkenyl group at one or more termini thereof with a silicon compound having both a silicon atom-bound hydrolyzable group and a hydrosilyl group and then converting said hydrolyzable group to a silanol group by hydrolysis.

45. (Withdrawn) The method of producing according to Claim 44, wherein the silicon compound having both a silicon atom-bound hydrolyzable group and a hydrosilyl group is chlorodimethylsilane.

46. (Withdrawn) A vinyl polymer having an acrylic functional group at one or more termini thereof and obtainable by the method of producing according to Claim 35.

47. (Withdrawn) The polymer according to Claim 46 which has a ratio (M_w/M_n) of weight average molecular weight (M_w) to number average molecular weight (M_n) of less than 1.8 as determined by gel permeation chromatography.

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48. (Withdrawn) A curable composition
which comprises the vinyl polymer having an acrylic functional group at one or more
termini thereof according to Claim 46.

49. (Withdrawn) The curable composition according to Claim 48
which comprises a photopolymerization initiator so as to be cured by irradiation of light
and/or electron beams.

50. (Withdrawn) The curable composition according to Claim 49,
wherein the photopolymerization initiator is a photo radical initiator.

51. (Withdrawn) The curable composition according to Claim 49,
wherein the photopolymerization initiator is a photo anion initiator.

52. (Withdrawn) The curable composition according to Claim 48
which comprises a heat polymerization initiator so as to be cured by heating.

53. (Withdrawn) The curable composition according to Claim 48
which comprises a radical-polymerizable group-containing monomer and/or oligomer.

54. (Withdrawn) The curable composition according to Claim 48
which comprises an anion-polymerizable group.

55. (Withdrawn) The curable composition according to Claim 53,
wherein the radical- or anion-polymerizable group is an acrylic functional group.

56. (New) A process for preparing a vinyl polymer having a silanol group at one or more
termini thereof, which comprises:

- (1) synthesizing a vinyl polymer by living radical polymerization,
- (2) subjecting a compound having at least two low-polymerizable alkenyl groups to reaction
as a second monomer at the final stage of said polymerization or after completion of the

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reaction involving a predetermined monomer(s) to thereby synthesize a vinyl polymer having an alkenyl group at one or more one termini thereof,

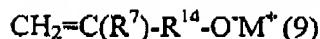
(3) carrying out the hydrosilylation reaction of said vinyl polymer having an alkenyl group at one or more one termini thereof with a silicon compound having both a silicon atom-bound hydrolyzable group and a hydrosilyl group, and

(4) converting said hydrolyzable group to a silanol group by hydrolysis.

57. (New) A process for preparing a vinyl polymer having a silanol group at one or more termini thereof, which comprises:

(1) synthesizing a vinyl polymer having a halogen atom at one or more one termini thereof by atom transfer radical polymerization,

(2) reacting said vinyl polymer having a halogen atom at one or more one termini thereof with an alkenyl-containing oxyanion represented by the general formula (9) or an alkenyl-containing carboxylate anion represented by the general formula (10) to thereby substitute said alkenyl group for said halogen atom:



wherein R^7 represents a hydrogen atom or a methyl group and they may be the same or different, R^{14} represents a divalent organic group containing 1 to 20 carbon atoms, which may optionally contain one or more ether bonds, and M^+ represents an alkali metal ion or a quaternary ammonium ion;



wherein R^7 represents a hydrogen atom or a methyl group and they may be the same or different, R^{14} represents a divalent organic group containing 1 to 20 carbon atoms, which may optionally contain one or more ether bonds, and M^+ represents an alkali metal ion or a quaternary ammonium ion,

(3) carrying out the hydrosilylation reaction of a vinyl polymer having an alkenyl group at one or more one termini thereof obtained above reaction (2) with a silicon compound having both a silicon atom-bound hydrolyzable group and a hydrosilyl group, and

(4) converting said hydrolyzable group to a silanol group by hydrolysis.

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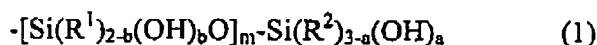
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58. (New) The process according to Claim 56 or 57,

wherein the main chain of said vinyl polymer having a silanol group at one or more termini thereof is obtained by the polymerization of at least one monomer selected from the group consisting of (meth)acrylic monomers, acrylonitrile monomers, aromatic vinyl monomers, fluorine-containing vinyl monomers and silicon-containing vinyl monomers.

59. (New) The process according to Claim 56 or 57,

wherein the silanol group is represented by the general formula (1):



wherein R^1 and R^2 are the same or different and each represents an alkyl group containing 1 to 20 carbon atoms, an aryl group containing 6 to 20 carbon atoms or an aralkyl group containing 7 to 20 carbon atoms or a triorganosiloxy group represented by $(R')_3\text{SiO-}$, in which R' is a monovalent hydrocarbon group containing 1 to 20 carbon atoms and the three R' groups may be the same or different; when there are two or more R^1 or R^2 groups, they may be the same or different; a represents 0, 1, 2 or 3, b represents 0, 1 or 2, and m is an integer of 0 to 19, provided that the relation $a + mb \geq 1$ should be satisfied.

60. (New) The process according to Claim 59,

wherein, in general formula (1), $m = 0$.

61. (New) The process according to Claim 56 or 57,

wherein said vinyl polymer having a silanol group at one or more termini thereof has a ratio (M_w/M_n) of weight average molecular weight (M_w) to number average molecular weight (M_n) of less than 1.8 as determined by gel permeation chromatography.

62. The process according to Claim 56,

wherein the living radical polymerization is carried out in the manner of atom transfer radical polymerization.

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63. (New) The process according to Claim 57 or 62,

wherein a metal complex to be used as a catalyst for the atom transfer radical polymerization is a copper, nickel, ruthenium or iron complex.

64. (New) The process according to Claim 57 or 62,

wherein the catalyst for atom transfer radical polymerization is a copper complex.

65. (New) The process according to Claim 56 or 57,

wherein the silicon compound having both a silicon atom-bound hydrolyzable group and a hydrosilyl group is chlorodimethylsilane.

66. (New) A curable composition

which comprises the vinyl polymer having a silanol group at one or more termini thereof prepared according to the process of Claim 56 or 57.

67. (New) The curable composition according to Claim 66

which further comprises a silicon compound having two or more silicon atom-bound hydrolyzable groups.

68. (New) The curable composition according to Claim 67,

wherein the silicon compound having two or more silicon atom-bound hydrolyzable groups is represented by the following general formula (2):



wherein R^3 and R^4 are the same or different and each represents an alkyl group containing 1 to 20 carbon atoms, an aryl group containing 6 to 20 carbon atoms, an aralkyl group containing 7 to 20 carbon atoms or a triorganosiloxy group represented by $(R')_3SiO-$, in which R' is a monovalent hydrocarbon group containing 1 to 20 carbon atoms and the three R' groups may be the same or different and, when there are two or more R^3 or R^4 groups, they may be the same or different, Y' represents a hydrolyzable group other than a hydroxyl group, Z represents an alkyl

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group containing 1 to 20 carbon atoms, an aryl group containing 6 to 20 carbon atoms, an aralkyl group containing 7 to 20 carbon atoms, a triorganosiloxy group represented by $(R')_3SiO-$, in which R' is as defined above, or a hydrolyzable group other than a hydroxyl group, a represents 0, 1, 2 or 3, b represents 0, 1 or 2 and m is an integer of 0 to 19 provided that when Z is a hydrolyzable group, the relation $a + mb \geq 1$ should be satisfied and, when Z is other than a hydrolyzable group, the relation $a + mb \geq 2$ should be satisfied.

69. (New) The curable composition according to Claim 68, wherein the hydrolyzable groups, namely Y' and Z , in general formula (2) are each selected from the group consisting of ketoximo, acyloxy, alkoxy, amido, aminoxy, amino and alkenoxy groups.

70. (New) The curable composition according to Claim 66 which further comprises a polymer, said polymer having a silicon atom-bound hydrolyzable group(s) and no silanol group.

71. (New) The curable composition according to Claim 70, wherein the polymer having a silicon atom-bound hydrolyzable group(s) and no silanol group has a skeleton comprising at least one polymer selected from the group consisting of polysiloxane polymers, polyether polymers, hydrocarbon polymers and vinyl polymers.

72. (New) The curable composition according to Claim 71, wherein the polymer having a silicon atom-bound hydrolyzable group(s) and no silanol group has a skeleton comprising at least one polymer selected from the group consisting of polyisobutylene, (meth)acrylic polymers and styrenic polymers.